The Maryland Fruit Grower

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College Park, Maryland

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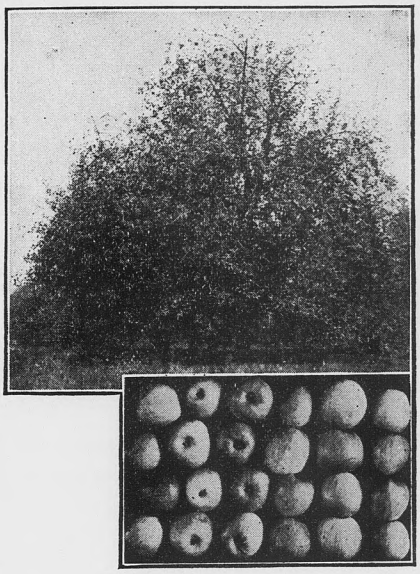

Photograph of an apple tree sprayed with Koppers Flotation Sulphur. Note the healthy condition of foliage and grade A fruit.

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Don't wait for your orchard to show these signs: "Fruit spur and terminal growth is short, the bark becomes tight, the fruit doesn't size up, much of the fruit cracks during summer when dry spells are followed by rains, die-back or rosette appears on the terminals, more top and root injuries occur in winter, and in many cases the addition of nitrogen fertlizers gives very little response."

These are the indications your orchard gives you that you should immediately turn your attention to getting more organic matter in your soil. "It is the only way to permanently improve the soil and prevent the occurence of such troubles."

SOD ORCHARDS: Test soils and apply lime as needed. "Whatever fertilizers are needed for improving the growth of the sod should be added. This may mean a high grade complete fertilizer consisting of Nitrogen, Phosphorus and Potash."

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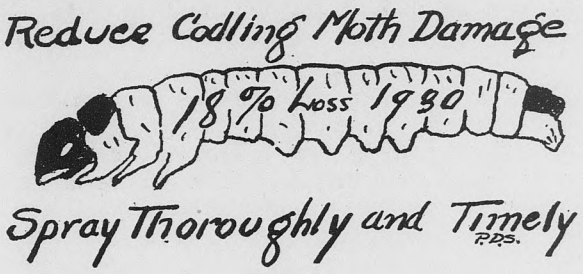

As a parting suggestion to the Maryland apple growers before assuming his new duties with the U. S. Department of Agriculture as Extension Entomologist for the Southern States, Mr. P. D. Sanders writes as follows:

"Control the codling moth in 1931" should be the slogan of the Maryland State Horticultural Society in view of what happened last year. On May 15, 1931, the overwintering codling moths had not begun to emerge and lay eggs in the orchards. Yet on this date in 1930 at Hancock, 34% of the spring brood had emerged and were laying eggs and at Salisbury 40% had emerged. This means only that the codling moths are off to a late start in 1931, so keep ahead of them.

Last year the codling moth worms destroyed 18% of the Maryland apple crop. The damage varied, of course, in different orchards from as low as 2% to above 56%. The degree of control depended upon such factors as the carry-over of worms from the previous crop in the orchards and packing houses, the number and thoroughness of arsenical sprays applied, and their timeliness. In 1931 there is the largest carry-over of worms in Maryland orchards ever recalled. As for the number of sprays advised this year, every grower should have in his possession a copy of the Maryland Spray Calendar, "Spraying for Better Fruit in 1931" as a reference. The thoroughness of application rests with the man on the rig, but experience last year proved conclusively that trees must be sprayed thoroughly from inside the tree if worms are to be held in check. Growers cannot overlook the importance of good coverage in a codling moth control program. Timeliness of application should depend upon moth activity in the orchard.

The Department of Entomology of the University of Maryland is making special efforts this year to time more accurately the codling moth sprays by daily checking on moth activity at five different points in the State. Several thousand worms were induced to "spin-up" last fall, in corrugated pasteboard bands. These were collected and placed in screen wire cages at Hancock, College Park, Easton, Salisbury and Berlin, where arrangements have been made to keep daily records on moth emergencies. The time the moth begins to emerge and lay eggs and the length of this period must be known thoroughly if the worms are to be poisoned successfully. That is, all efforts must be directed against the elimination of the first brood worms. This necessitates an understanding of the activities of the moth by the grower and a thorough job of spraying—striking the under-surfaces of the leaves and particularly the upper third of the three. If the first brood is thoroughly controlled there will be no injurious second brood, but where the first brood is poorly controlled, resulting in considerable wormy apples in June, it is practically impossible to control the second brood.

It should be remembered that the codling moth worms pass the winter under the rough bark of the tree trunks, in packing houses, picking baskets, or any other places where infested fruit was stored the previous fall. These worms pupate in early spring and begin to emerge as adult moths soon after apples bloom. Egg laying begins in about three days, practically *all of them being placed on the foliage.* Fluctuating with high and low temperatures this emergence and egg laying of the first brood moths continues some years as late as the first or second week in July. The time required for the incubation of the egg depends upon the temperature, but generally, hatching does not begin until about three weeks after the petal fall stage of the apple. Upon hatching from the egg, the young worm crawls to the underside of the leaf to feed for a while before proceeding to the nearest apple. This habit of the worms of feeding for several hours on the undersurfaces of the leaves offers the fruit grower his greatest opportunity to poison the insect. It is therefore essential in codling moth control to cover the undersurfaces of the leaves with arsenate of lead as soon as hatching begins and keep them covered until July 15 or 20 to poison the young worms before they reach the appples. Under weather conditions existing in Maryland, this usually requires an arsenical spray every two weeks to cover new foliage and to renew the coverage removed by rains. Most of the worms hatching in June when the apples are small enter the fruit through the calyx end. This fact stresses the importance of filling the calyx lobes with arsenate of lead at the petal fall stage.

As the season advances into mid-summer and the apples begin to size up, the adult moths turn their attention from the foliage and start *placing their eggs directly on the fruit.* The worms hatching from these eggs gnaw immediately into the fruit without feeding to any extent on the surface. Also the worms hatching from the few eggs laid on the foliage at that time enter the fruit readily through the sides, instead of the calyx end, thereby escaping the poison deposited there at the petal fall stage. These two facts acting together make codling moth control with arsenate of lead after July, of very doubtful value. Some excellent work is being done on non-arsenical sprays for use against late broods of codling moth, but until further work is done these materials cannot be recommended for commercial use. Chemcally treated codling moth bands are advised only in orchards where worms have been extremely injurious. They should be applied prior to June 15. In order to reduce the arsenical residue problem fish oil or other spreaders should not be used after the first cover spray.

Recommendations

1. Be prepared to spray thoroughly, that is, from 8 to 12 gallons per tree, on large trees applied so as to strike the under-surfaces of the leaves.

2. Use three (3) pounds of arsenate of lead to each 100 gallons of spray except where the codling moth was extremely injurious last year, and in those orchards use 4 pounds in the first cover spray.

3. Keep picking boxes and baskets in moth-tight houses until harvest to prevent the moths from flying from them into the orchards.

4. Time your applications according to moth emergence. The moth emergence records obtained at various points in the State will be made available to growers throughout the season.

Suggestions of Peach Thinning

A. J. Farley
Extension Fruit Specialist, New Brunswick, New Jersey

The natural tendency of every fruit tree is to set more fruit than it can properly develop into attractive specimens of large size and high color. The tree in its attempt to produce a maximum crop of seed draws upon its resources to such an extent that the edible or fleshy part of the fruit is materially reduced. It so happens that the market value of fruit depends almost entirely upon the development of the fleshy parts and not upon the amount of seed. It has been repeatedly demonstrated that the proper thinning of peaches on heavily loaded trees increases the size, color and quality of the fruit, prevents breaking of the trees and results in a more uniform crop. On the other hand, there are conditions under which it does not pay to thin peaches. The first thing necessary to make thinning pay is a heavy set of fruit. It certainly will not pay to thin peaches if the set is relatively light, because of winter injury, late spring frosts or any other condition that directly or indirectly affects the set of fruit. Furthermore, it does not pay to thin unless the variety is such that the fruit can be sold with a fair margin of profit. For example, if Carman peaches from thinned trees cannot be sold at a profit, why spend money on thinning? On the other hand, if Carman peaches from thinned trees can be sold at a profitable price while the same variety from unthinned trees sells at a loss, it certainly pays to thin Carman.

Given a heavy set of fruit on trees of a variety that is usually profitable, there are two problems to be considered. First: the amount of fruit to be removed in order to secure maximum returns from thinning; second; the proper time to thin for best results.

AMOUNT OR DEGREE OF THINNING

Experiments and observatoins indicate that other things being equal there is a direct relation between degrees of thinning and size of fruit at maturty. In other words, the smaller the crop left on healthy trees after thinning, the larger the individual fruits will be at maturity. The thinning problem, therefore, as far as degree or amount is concerned is a question of how much increase in the average size of the individual fruits can be secured without a decrease in crop that will offset the advantage gained through being able to market a larger and better grade of fruit. In other words, the degree of thinning may be carried to such an extreme that the advantage gained in size of fruit will be lost by a decrease in yield. Such varieties as Greensboro, Carman and Lola generally require rather severe thinning for best results, while Hiley and Belle should be thinned moderately and Elberta and Hale lightly. A severe thinning would remove at least 50 per cent of the young fruits, a modrate thinning 30 to 40 per cent and a light thinning not over 20 or 25 per cent. Furthermore, the same variety will respond favorably to different degrees of thinning depending upon the age and vigor of the trees, soil, climate and other factors. For example an old relatively weak tree with a havy set of fruit should be thinned more severely than a young, vigorous **tree of the same size and with** approximately the same set. It is essential, therefore that the individual grower study his trees in order to determine

the amount of fruit that should be removed by thinning in order to secure the most money per acre from his crop. One of the first things to determine before thinning is the average crop per tree in terms of baskets or bushels to be expected from a particular variety or orchard. For example; if 3 bushels of fruit per tree is considered a satisfactory crop for a certain block, a sufficient number of fruits should be left on each tree to fill 3 bushels with fruit of good marketable size. Approximately 200 fruits 2¼" to 2½" in transverse diameter or 150 fruits 2½" to 2¾" in diameter are required to fill a bushel basket. Since fruits ranging from 2¼" to 2¾" in diameter are the most desirable for the average market, every peach grower should attempt to grow fruit, a large percentage of which is within that range of size. In order to reach such an ideal at least 600 fruits should be left on a tree from which it is desired to harvest 3 bushels, 800 fruits for 4 bushels, 1,000 fruits for 5 bushels and so on. This may require a thinning that will leave the fruits 4" to 6" apart along the branches under some conditions and 6" to 8" under others. Elberta is inclined to set rather unevenly with clusters of fruit in some places and a more uniform distribution in others. Under such conditions a light to moderate thinning of the fruit in the clusters will generally accomplish the desired result. Carman, on the other hand, usually sets more uniformly heavy throughout the entire tree, thus requiring the removal of more fruits in order to assure uniform spacing and a desirable grade of fruit at maturity. The practical fruit grower might well ask "How am I to determine the number of fruits left on a tree after thinning?" The only accurate way to determine this is to make an actual count of the fruit left on certain branches that may represent a fourth, a third, or even one-half of the entire bearing surface of an average tree. It is not to be expected that each tree will have just the right number of fruits after thinning, but it should come within 100 or at the most 200 fruits of the desired number. For example, if 3 bushels are considered a satisfactory crop for a given tree and 150 to 200 fruits are required for each bushel, a tree on which 1,000 fruits were left to mature would produce a large percentage of small peaches. On the other hand, if such a tree were thinned down to 300 fruits the net returns per tree or per acre would be decreased because of the reduced crop. A normal range in the number of fruits that should be left on such a tree would be from 500 to 800 depending upon the variety, season, age and vigor of tree and uniformity of set.

TIME OF THINNING

The time of thinning peaches is fully as important as the degree or amount of fruit removed. Observations and measurements show that the young fruits grow quite rapidly up until the time the pits begin to harden when the growth is retarded and is relatively slow until two or three weeks before the fruit ripens, when the growth is again rapid, the rate increasing steadily until maturity. This characteristic habit of growth of the peach has led to the belief that it is essential that peach thinning be completed before the pits harden, n order to secure the best results. However, although the development and hardening of the pits have a direct effect upon the growth of the fruit, their relation to the time of thinning is not a very important consideration. Therefore, while it is desirable to recommend early thinning, the time should not necessarily be determined by the condition of the pits, since with the mid-season varieties at least there is quite a period of time during which peaches may be thinned with satisfactory results. Furthermore, under some

conditions early thinning may be very undesirable because of the danger of a late crop that may reduce the yield to a point that will entirely eliminate any advantage gained in size of fruit. It is always advisable to thin various varieties in their order of ripening, starting with early varieties like Greensboro and Carman immediately after or even a little before the June drop is over and leaving the later ripening varieties until the last. All varieties, however, should be thinned at least a month and preferably six weeks or even two months before ripening for best results. Late thinning should not be as severe as early thinning, since the effect on size is not as great, thus making it easier to reduce the crop to a point where the operation will not pay.

* * *

Grape Sprays

The early bud spray of grape was not necessary, due to absence of flea beetle. The next sprays on grapes are applied as follows: (1) when the new shoots are 6 to 10 inches long, (2) before blossoms open, (3) after blossoms fall, (4) just before berries touch in the cluster (or bunch). Use Bordeaux Mixture 4-5-50 and 1½ lbs. of lead arsenate to 50 gallons of spray material in all of these sprays. Black rot and flea beetle are pests to be controlled. Send to Extension Service, University of Maryland, College Park, for grape spray calendars.

* * *

Cane Fruits

Look over the berry plantation. Clean the trash out of the rows and turn it under by shallow plowing or disking. Of course, the old dead and weak canes have been cut out and burned. Watch for diseased plants and destroy them as they are noticed. If the hedgerow system is used in the black raspberries or blackberries, pinch off the tops of the new canes as they grow about waist-high. This gives strong, branching canes. Red raspberries are not usually tipped, unless they grow over 6 feet tall. Usually no spraying is necessary unless canes have scale, or leaves are attacked by chewing insects. In the first case, use a dormant spray of 1 to 9 concentrated lime-sulfur, and apply lead arsenate 1½ pounds to 50 gallons of water, if chewing insects appear. It is best not to apply lead sprays after fruit-set.

* * *

Codling Moth Bands

Chemically treated codling moth bands are advised only in orchards where codling moth worms have been extremely injurious. Growers planning to use any type of bands should write to the Entomology Department, University of Maryland, College Park, Maryland, for names of manufacturers.

Spray the tops of your trees well!

Does Apple Thinning Pay?

By Dr. E. C. Auchter

The value of spraying, pruning, cultivation, and in many cases fertilization, is now clearly recognized by most progressive fruit growers. The value of fruit thinning, however, is not so clearly recognized, and this orchard practice is often omitted even in those orchards where all other operations are thoroughly performed. The fact that this is so, suggests at once that its value is not so apparent and that several factors may influence the results obtained.

FACTORS TO BE CONSIDERED

In certain very favorable seasons the same number of apples per tree will average much larger than in others. Growers practicing thinning for the first time during such years might question its value. It is a fact also that in those years of general light fruit crops over the country, good prices are often received for comparatively small fruit. In such years the increased size of individual specimens, due to thinning, might not command enough increased price to pay. Even in normal years of fair crops and average prices, such factors as age of tree, vigor of tree, set of fruit, kind of soil, variety and cultural practices used, play a big part in determining whether thinning will pay.

For instance, apples such as Tompkins King and Mammoth Black Twig, which normally are good sized apples, and which normally do not set as high a percentage of blossoms as certain other varieties, show only a slight value from thinning in the same orchard where thinning might be very profitable in the case of such varieties as Wealthy and Winesap. It is quite evident also that vigorous trees on strong soils will develop the same number of apples much better than weaker trees on lighter soils. The same variety on the same soil might need severe thinning one year, due to a heavy set, and no thinning the next year, due to a light set. These examples cited are, of course common observations of growers and have been reported upon several times by investigators.

MARKET REQUIREMENTS

Even a casual study of market conditions reveals the fact that a premium is paid in this country for fruit of good size, color, and quality. With the gradual increase in commercial production we can expect the buyers to be more insistent than ever that fruit be of good size, color, and quality. It appears that it will not be profitable in the future to produce other than this kind of fruit.

INTERRELATION OF ORCHARD PRACTICES

It is of course well recognized that all such operations as pruning, spraying, fertilization, cultivation, thinning, etc., influence these three essential qualities (size, color, and quality), in fruit. It is not the purpose of this article, however, to discuss any of these different practices are interrelated in their effects and each one should of necessity be considered in relation to the others. For instance, poor spraying, pruning, fertilization, and cultivation would greatly offset the avantages of thinning. Again the favorable results secured from good pruning and fertilization might be greatly diminished by poor

spraying. It is well then to consider the interrelation of all of these factors in studying the effects of any one.

ADVANTAGES OF THINNING

Practically all experimental evidence and the experiences of growers show that where trees have set a heavy crop of fruit, the removal of part of it by thinning will result in a much better product at harvest time. Fruit from the thinned trees is generally of much better size and color, freer from blemishes and more uniform in grade. Recent investigations by the Horticultural Division of the U. S. Department of Agriculture, have shown that from 30 to 50 leaves per apple, depending upon the variety, are necessary if good size, color and quality of fruit is to be obtained. It can thus be seen that usually, considerable thinning will be necessary if the fruits left are to have enough leaf area per fruit to result in good size, color and quality. Even though the removal of from twenty to fifty per cent. of the crop might decrease the total crop of fruit per tree in some cases, still the amount of marketable fruit is generally as large or larger and is of course a much better product. Gaston* of Michigan, in a study of the more important commercial varieties of apples in that state has shown that in 1924, one-half, and in 1925, one-third of the B grade apples were placed in that class because of lack of size. In fact the Baldwin variety, during 1924, had 82 pe rcent. of the B. grade, and 65 per cent. of the cull grade placed there because of lack of size. There is no doubt but that systematic fruit thinning would be one of the ways of raising the percentages of the better grades of fruit under such conditions.

By removing part of the crop, especially on young trees, much breakage and permanent bending of branches will also be reduced. Although apples of much better size, color, and quality are produced by thinning in years of large crops, still contrary to popular belief, thinning cannot be relied upon to correct biennial bearing in some varieties, which normally produce a crop only every other year. Heavy thinning, together with the best orchard practices, may be of value in correcting this condition, however.

APPLE THINNING

Although considerable evidence, relative to the value of apple thinning has been published, it is always interesting to record and study recent findings. Apple thinning investigations were made during the year 1926 at the Maryland Experiment Station, and also in cooperation with orchardists in various parts of the state. Briefly, some of the results are as follows:

In one orchard of twelve year old Stayman Winesaps, in which the trees were rather low to medium in vigor, and where the set was heavy, results as shown in Table I were secured.

TABLE I.

Influence of Thinning on Size of Stayman Winesap.

Distance Thinned in Inches	Diameter of Fruit in Inches								Total Yield in Bushels
	0-2¼		2¼-2½		2½-2⅞		2⅞ up		
	Bu.	%	Bu.	%	Bu.	%	Bu.	%	
6— 8	.75	5.3	2.25	15.0	10.5	71.2	1.25	8.47	14.75
9—10	0.	0.	.12	.96	2.38	19.4	8.75	79.6	12.25
Check, (Unthinned)	2.25	15.28	6.0	40.68	6.38	43.21	.12	.81	14.75

It can be seen that all thinned trees produced fruit of much better size than the checks. The trees thinned 9 to 10 inches apart had their total yields somewhat reduced. The greatest quantity of marketable fruit was produced from those trees thinned 6 to 8 inches apart. As much marketable fruit was produced on the trees thinned 9 to 10 inches as on the checks and the fact that the fruit from these trees was much larger than that from either of the other group resulted in a greater net return from these trees. On the trees thinned 9 to 10 inches apart, approximately 80 per cent. of the fruit was over 2⅞ inches in diameter compared to 8.5 per cent. in the 6 to 8 inch group and less than 1 per cent. in the checks.

The thinned fruit was also noticeably better in color, more uniform in shape, and freer from all blemishes.

Similar results were also secured in thinning experiments with 18 year old Stayman trees of good vigor and growing on good soil. In this case there was very little difference in results between the trees thinned 6 to 7 inches apart, and those thinned 9 to 10 inches. Both were much better than the check and the grower was enthusiastic over the advantages of thinning.

Results of thinning experiments on 16 year old, vigorous Stark trees, bearing a heavy crop, was as follows: Trees with the fruits thinned 6 to 8 inches apart had 90 per cent. of the fruit from 2½ to 3 inches in diameter, 5.75 per cent. from 2¼ to 2½ inches in diameter, and 2.2 per cent. below 2¼ inches. The fruit from the unthinned trees graded as follows: 66.6 per cent. was in the 2½ to 3 inch grade, 22.3 per cent. in the 2¼ to 2½ grade, and 11.1 per cent. was below 2¼ inches. Approximately 13.5 bushels of fruits were produced per tree in each case. Thus thinning was profitable in this case also, but the advantages were not as striking as in the 12 year old Stayman Winesap shown in Table I. Mason* has also recently shown decided benefits and net increased profits from thinning the old Winesap in New Jersey. In his experiments the fruit was thinned from 6 to 8 inches apart.

Ballou of Ohio gives the following results from thinning Rome apples:

	Yield in Bushels		
Rome Apples	Firsts	Seconds	Culls
No thinning	10.86	6.44	1.4
Thinned 6 to 8 inches apart	14.38	5.00	1.5

Gourley of Ohio has also averaged the results secured from ten carefully conducted experiments in various eastern and central states. The results are given in the following table:

Value of Thinning Apples. (Average of ten experiments.)

	Percentage No. 1	Percentage No. 2	Percentage culls
Unthinned	43	48	6
Thinned	71	24	3

TIME TO THIN

In practically all cases the sooner that thinning can be done after the June drop, the better will be the results. However later thinning will also be beneficial and some increase in size and color will result if the thinning is unavoidably delayed until a few weeks before picking.

METHODS AND DISTANCES

In thinning apples it should be the aim to remove all injured, diseased or insect-stung fruit, and the small green and knotty apples on the lower inside limbs which seldom ever become marketable. Clusters should be reduced to one apple each and the remaining apples on the limb should be thinned to a certain distance, depending on different conditions such as age of tree, set of fruit, vigor of tree, etc. In most of our experiments six to seven inches apart seemed most satisfactory.

Fruits on certain heavily loaded limbs need not be thinned as heavily if crop is light on the rest of the tree, as would be the case if the whole tree was carrying a heavy load.

Thinning by hand seems to be the fastest and cheapest method in most cases.

Eight to ten year old apple trees producing a barrel per tree can be thinned by one man in approximately twenty minutes. Low headed, middle aged trees, bearing about five barrels per tree can ordinarily be thinned by one man in about one and one-half hours.

THE COST OF THINNING OFFSET BY OTHER ADVANTAGES

The cost of thinning per tree can be determined by multiplying the above figures by the prevailing wage per hour. However, investigations show that only a small part, if any, of the cost of thinning should be charged against the thinned trees. In the first place the fruit thinned off would have to be removed at picking time anyway, and the cost of removal would not be much different in either case. In the second place it takes much longer and costs more in sorting to pick out the larger amount of culls on the unthinned trees, and these culls are then not salable.

*Gaston, H. P., "Why a cull apple is a cull." Mich. Special Bulletin 160. (1917)

Herrick, R. S. Thinning the Winesap, Colorado Agricultural Exp. Sta. Bul. 170. (1910)
Batchelor, L. D. Thinning apples, by Utah Agr. Exp. Sta. Cir. 12. (1913)
Beach, S. A. Thinning apples, N. Y. Agr Exp Sta Bul 239. (1903)
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Tufts, W. P. Thinning deciduous fruits, Cal Agr Exp. Sta. Bul. 258. (1923)
Auchter, E. C. Five year's investigations in apple thinning, W. Va. Agr. Exp. Sta. Bul. 162. (19173
Mason, A. F. Some factors which influence size and color of apples. Pa. State Hort. Soc. (1926)

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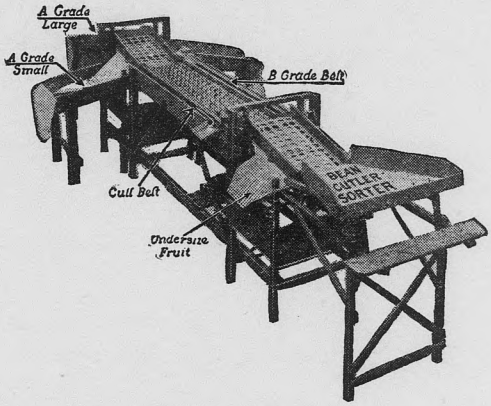

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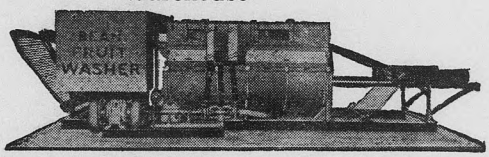

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Niagara

KOLOFORM

KOLOFORM is now recognized everywhere fruit is grown as the IDEAL SUMMER SPRAY for the following reasons:

KOLOFORM is a noncaustic material that controls fungus diseases WITHOUT INJURY TO FRUIT OR FOLIAGE. NO RUSSETING —does not cause fruit drop. IT IS SAFE.

KOLOFORM contains fused Bentonite-Sulphur, which is an infinitely fine COLLOIDAL sulphur. No other form of sulphur is so fine or effective.

KOLOFORM gives protection through rain or wind—it sticks to fruit and foliage.

KOLOFORM is liked especially for the BETTER FINISH it gives your fruit.

KOLOFORM is non-abrasive. It will not cut your pumps or injure your equipment. ALWAYS UNIFORM.

KOLOFORM is packed in convenient dry form for ready use in the spray tank. It mixes readily with water—stays in suspension—pleasant to use.

KOLOFORM is a CLEAN spray.

If you have missed a trial of this, get acquainted and save yourself time, worry and loss of fruit!

NIAGARA SPRAYER and CHEMICAL CO., Inc.

Middleport, N. Y.